PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : B27B 25/02 — A1

(11) International Publication Number: WO 99/16598

(43) International Publication Date: 8 April 1999 (08.04.99)

(21) International Application Number: PCT/FI98/00752

(22) International Filing Date: 24 September 1998 (24.09.98)

(30) Priority Data:
973810 26 September 1997 (26.09.97) FI

(71) Applicant *(for all designated States except US)*: PONSSE OYJ [FI/FI]; FIN-74200 Vieremä (FI).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: HYVÖNEN, Jonna [FI/FI]; Makkaralahdenkatu 13 A 8, FIN-74120 Iisalmi (FI). ALHAINEN, Paavo [FI/FI]; Haukilammentie 5, FIN-82380 Tolosenmäki (FI).

(74) Agent: POHJANMAAN PATENTTITOIMISTO KOLSTER OY; c/o Kolster Oy AB, Iso Roobertinkatu 23, P.O. Box 148, FIN-00121 Helsinki (FI).

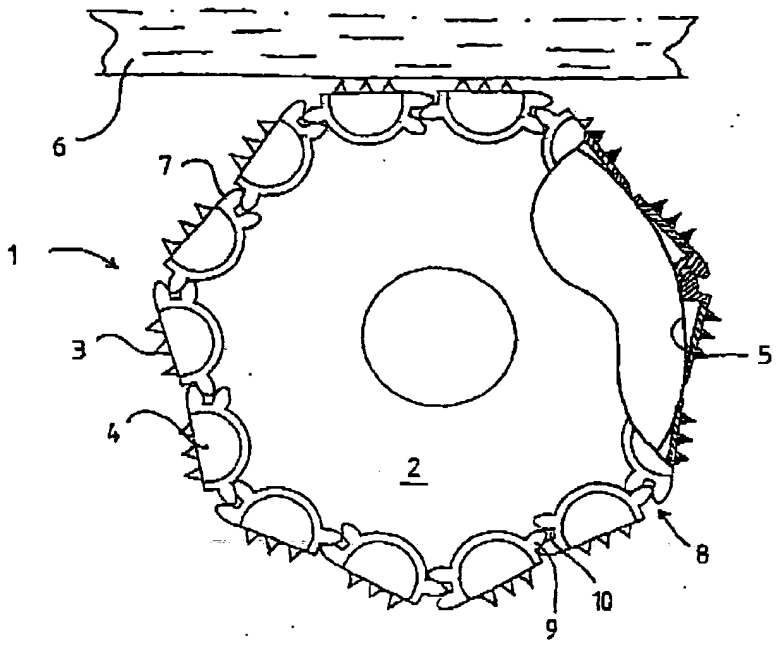
(81) Designated States: AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, EE (Utility model), ES, FI, FI (Utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) Title: FEED ROLLER

(57) Abstract

The present invention relates to a feed roller (1) for use in feeding timber (6). Such a feed roller comprises a body (2) having disposed around its periphery (5) friction elements (4) for improving the engagement between the feed roller and the log. In the device of the invention the friction elements (4) are coupled together mechanically by coupling means (8, 10), the friction element on the surface of the log being arranged to guide the following friction element to the log at the right angle. Such mechanical coupling between the friction elements (4) efficiently prevents harvesting damages.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece			TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	NZ	New Zealand		
CM	Cameroon			PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

FEED ROLLER

The present invention relates to a feed roller for use in feeding timber, the feed roller comprising a body having disposed around its periphery friction elements, which comprise anti-slip elements and are disposed rotatably around a shaft transverse to the rotational direction of the feed roller and serve to improve the engagement between the feed roller and the log.

Feed rollers of this kind are generally used in harvesters. In this context, a feed roller refers to a roller directing both a pulling and pushing motion to the log e.g. in such a harvester. Consequently, a drive wheel, feed wheel or roller wheel may be involved. Generally known feed roller techniques include fixed wheels mostly made of steel, and wheels containing different kind of drive elements and rubber mixtures.

Fixed rollers used as feed rollers usually consist of a cylinder and various almost immobile anti-slip elements attached thereto. These are easy to manufacture, but because of an unfavourable distribution of surface tension, they easily damage the surface of the log. With increasing mechanical harvesting, surface damage to the timber has become an increasingly important factor in the economic use of timber.

Feed rollers of this kind comprising anti-slip elements articulated to the feed roller are disclosed in publications EP 0 478 522 and FI 54244, for example. To enable a small swinging motion of the anti-slip element, dampers made of a rubber material are disposed in connection with, preferably between, the anti-slip elements according to EP 0 478 522, for example.

However, previous solutions have drawbacks which have so far not been solved. For example, when a feed roller is provided with rubber dampers in the friction elements, the dampers bind some of the feeding energy directed to the log by the feed roller, resulting in an increased need for feed force. Increased use of force, in turn, increases the surface pressure of the feed roller, causing unfavourable heating to the roller and its rubber coating. Heating of the roller, in turn, leads to changes in roller dimensions, causing inaccuracy to the measurement of the logs. Heating of the roller and the rubber, in particular, reduces the service life of rubber rollers. This results in impaired grip characteristics, and the roller coating has to be renewed repeatedly. Besides being expensive, such renewal of the coating causes unnecessary idle periods to valuable machinery.

In known solutions the friction elements are arranged to slavishly

follow the movements of the surface of the feed roller. This makes the friction elements or the anti-slip elements therein to dig into the surface of the log being conveyed causing disadvantageous damage to the surface.

FI 54244 differs from other solutions in that the friction elements of the feed roller are arranged to swing along the surface of the fed timber. However, such articulation of the feed roller is structurally difficult to implement to ensure a sufficient strength. Furthermore, the front edges of the friction elements in such a feed roller hit the surface of the log first, usually causing the friction elements and/or the anti-slip element therein to momentarily dig into the surface of the log, resulting in permanent damage to the surface of the log.

It is an object of the present invention to eliminate prior art drawbacks and provide a completely new kind of solution providing better friction properties and a more even feeding motion that previously. It is a further object of the invention to provide a feed roller without harmful wear characteristics of rubber-coated wheels, resulting in longer maintenance intervals.

This object is achieved by the feed roller having the characteristics of the present invention as defined in the claims. To be more exact, the device of the present invention is mainly characterized in that the friction elements are mechanically coupled together by a coupling means, the successive friction elements at the periphery of the feed roller being coupled together with respect to their swinging motion.

The invention is based on the idea that no rubber or other flexible elements are needed to even out the surface pressure, instead the friction means provided with anti-slip elements are articulated to the body so that as many anti-slip elements as possible are constantly in contact with the surface of the log. The articulation between the body and the friction element minimizes the swinging of the friction element and the anti-slip element in the timber when the feed roller is rotating.

The turning of the friction element around the fulcrum, caused by the traction force of the log, does not have to be limited or dampened by e.g. rubber if the fulcrum of the friction element is disposed preferably in the vicinity of that surface of the friction element which faces the log. In this case the friction element is immobile during feeding with respect to the surface of the log.

The structure of the feed roller according to the invention provides significant advantages. The arrangement of at least two arrays of anti-slip elements on the surface of the friction element enables a greater number of

arrays of anti-slip elements than usual to be constantly in contact with the surface of the log. The friction elements of the invention are also immobile with respect to the surface of the log when the feed roller is rotating, the entire surface of the friction element resting against the surface of the log. Similarly, the entire surface of the friction element is detached substantially simultaneously. This naturally provides a significant improvement compared with fixed anti-slip elements in a feed roller, when, in the most disadvantageous situation, only one array of anti-slip elements contacts the surface of the log being conveyed. The present invention also avoids the penetration by the friction elements and anti-slip elements of conventional feed rollers of the surface of the log. This way excessive damage to the surface of the log can be avoided and consequently as high a market value for the timber as possible can be maintained.

With a significant friction element turning radius, the device of the invention provides a feed roller having an even surface pressure even at lumps and other roughness on the surface of the log.

The radius of the feed roller is always substantially constant, since the friction element of the invention does not have to be mobile in the direction of the radius of the feed roller. This allows measurement of various magnitudes, such as thickness, of the log from the control mechanisms of the feed rollers.

Without rubber coatings and damping structures, the feed rollers of the invention provide a product having a significantly longer maintenance interval than other known solutions. This allows the machinery to be used more efficiently for productive work. This also provides a feed roller whose measurement accuracy shows no substantial variations caused by temperature changes.

Furthermore, the friction elements of the feed roller of the invention are more simple to repair, even by the user alone, resulting in significant savings in maintenance costs.

In the following the invention will be described in greater detail by means of the attached drawings, in which

Figure 1 is a side view of an embodiment of the feed roller of the invention in partial cross-section, the friction elements being arranged schematically in the feed roller, and

Figure 2 is a side view of a feed roller of a second embodiment of

the invention, showing only part of the friction elements in the feed roller.

Figure 1 shows a basic embodiment of the feed roller of the invention. Such a feed roller 1 comprises a body 2 having friction elements 4 provided with anti-slip elements 3.

The body 2 is preferably made from steel plate and is shaped substantially as a circular plate, but may also be shaped as e.g. a circular cylinder or a polygon. In the middle the body comprises a hole to accommodate a steering shaft coupled to an engine controlling the feed roller, and mounting holes for mounting the body to the shaft.

The friction elements 4 are disposed rotatably at the periphery 5 of the body 2 in a manner known per se. The friction elements are arranged to turn in the rotational plane of the feed roller 1 so that, when moving, they adhere to the surface of the log 6 conveyed in the device and always direct an even pressure to the surface of the log.

The preferred embodiment of the invention shown in Figure 1 distinctly indicates the basic idea of the invention. The friction elements 4 are coupled together mechanically in the feed roller 1, and the friction element on the surface of the log 6 is arranged to guide the following friction element so that it contacts the surface of the log at the right angle when the feed roller is rotating. In this way the front edge 21 of the friction element or the anti-slip element 3 on the surface of the friction element does not hit the surface of the log in the usual manner, digging into it and damaging it. Instead, the friction element immediately places itself substantially in the direction of the surface of the log, using the maximum area to grip the log. Such mechanical coupling between the friction elements 4 thus efficiently prevents harvesting damage.

In the embodiment shown in Figure 1, the coupling means 8, employed for the mechanical coupling of the friction elements, comprises a cogwheel arrangement, e.g. what are known as involute gear teeth sectors. In this case the friction element 4 comprises coupling elements 9 and 10 at opposite ends in the sectional plane of its rotational direction. Consequently, one end of the friction element comprises a projection 9 and its opposite end a groove 10, formed by e.g. two projections, for receiving the projection of an adjacent friction element. The coupling elements are preferably arranged transversely to the rotational direction of the feed roller 1 and form a fulcrum between the friction elements.

A slot/pin coupling 11 shown in Figure 2 can also be employed in

coupling the friction elements 4 together to achieve a mutual control motion. In this case one end of the friction element comprises a slot 12 and the other end a pin 13 for accommodating the slot of an adjacent friction element.

It is to be understood that the foregoing description and the related figures are only intended to illustrate the present invention. It is obvious that the invention is not restricted only to the above description or the embodiment disclosed in the claims, but it will be apparent to those skilled in the art that many variations and modifications may be made to the present invention without departing from the inventive idea defined in the attached claims.

In other words, the coupling means 8 or 11 can also be implemented by another coupling method, such as a flexible wire-like coupling means, a claw coupling, or another machine element known per se.

CLAIMS

1. A feed roller (1) for use in feeding timber (6), the feed roller comprising a body (2) having disposed around its periphery (5) friction elements (4), which comprise anti-slip elements (3) and are disposed rotatably around a shaft transverse to the rotational direction of the feed roller and serve to improve the engagement between the feed roller and the log, **characterized** in that the friction elements (4) are mechanically coupled together by a coupling means (8, 11), the successive friction elements at the periphery (5) of the feed roller being coupled together with respect to their swinging motion.

2. A device as claimed in claim 1, **characterized** in that the coupling means (8) of the friction elements (4) is a cogwheel arrangement, in which the ends of the friction element comprise coupling elements (9, 10) in the sectional plane of its rotational direction, the coupling elements comprising a projection (9) at one end and at the other end a groove (10) for receiving the projection of an adjacent friction element.

3. A device as claimed in claim 2, **characterized** in that the friction elements (4) are arranged substantially transversely to the rotational direction of the feed roller (1) and form a fulcrum between the friction elements.

4. A device as claimed in claim 1, **characterized** in that the coupling means (11) of the friction element (4) is a slot/pin coupling, one end of the friction element comprising a slot (12) and the opposite end comprising a pin (13) to be arranged in the slot of an adjacent friction element.

5. A device as claimed in claim 1, **characterized** in that the coupling means of the friction elements (4) comprises a flexible wire-like coupling means for coupling together the edges of adjacent friction means.

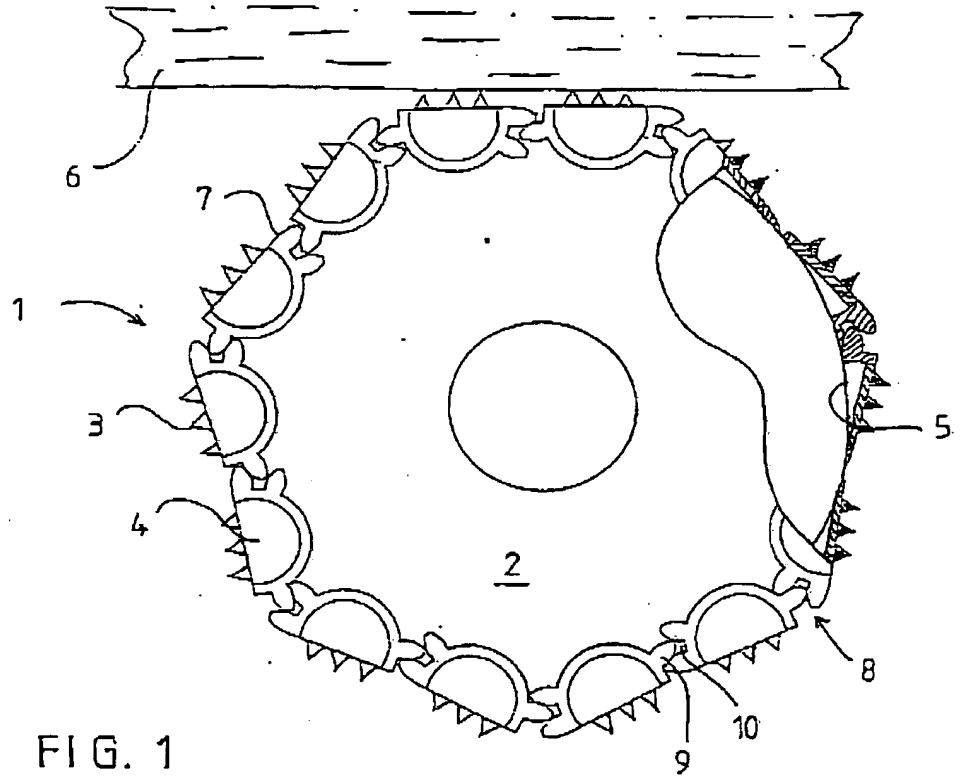


FIG. 1

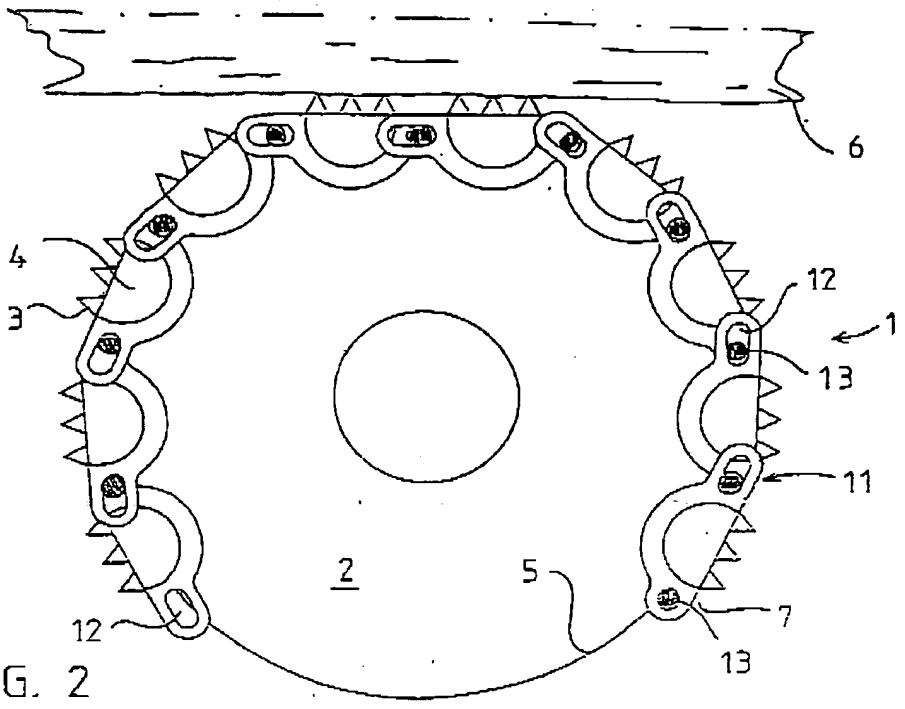


FIG. 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 98/00752

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B27B 25/02
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B27B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 848784 A (AKTIENGESELLSCHAFT DER EISEN- UND STAHLWERKE VORMALS GEORG FISCHER), 7 November 1939 (07.11.39), figure 3	1
A	--	2-5
A	EP 0822039 A1 (PONSSE OY), 4 February 1998 (04.02.98)	1-5
A	-- US 3687271 A (LINDBLOM), 29 August 1972 (29.08.72)	1-5
	--	

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" erlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
12 January 1999	15 -01- 1999
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Eddy Leopold Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

01/12/98

International application No.
PCT/FI 98/00752

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 848784 A	07/11/39	NONE	
EP 0822039 A1	04/02/98	FI 101206 B	00/00/00
		FI 963046 A	02/02/98
US 3687271 A	29/08/72	CA 921944 A	27/02/73
		DE 2109069 A,B,C	16/09/71
		FI 54244 B,C	31/07/78
		SE 337198 B	26/07/71

Form PCT/ISA/210 (patent family annex) (July 1992)